S.Q. TUBE

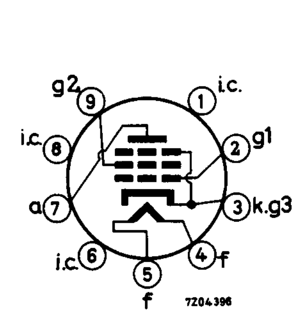
Special quality output pentode designed for use as wide band amplifier, series regulator tube and power output tube.

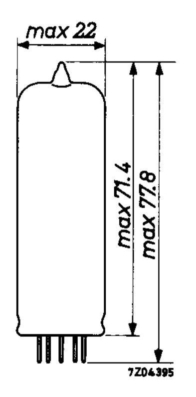
QUICK REFERENCE DATA			
Life test	10 000 hours		
Low interface resistance			
Mechanical quality	Shock and vibration resistant		
Base	Noval		
Heating	Indirect A.C. or D.C.; parallel supply		
Heater voltage	V_f	6.3	V
Heater current	I_f	760	mA
Anode current	I_a	48	mA
Mutual conductance	S	11.3	mA/V
Output power, one tube	W_o	6	W

DIMENSIONS AND CONNECTIONS

Dimensions in mm

Base: Noval





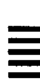
CHARACTERISTICS

Column I Nominal values or setting of the tube
II Range values for equipment design: Initial spread
III Range values for equipment design: End of life

		I	II	III	
Heater voltage	V_f	6.3			V
Heater current	I_f	760	720 - 800		mA
Anode voltage	V_a	250			V
Grid No.2 voltage	V_{g2}	250			V
Cathode resistor	R_k	135			Ω
Anode current	I_a	48	42 - 54	min. 32	mA
Grid No.2 current	I_{g2}	5.5	4 - 7		mA
Mutual conductance	S	11.3	9.2 - 13.4	min. 7.5	mA/V
Amplification factor	$\mu_{g_2g_1}$	19			
Internal resistance	R_i	40			kΩ
Negative grid current	$-I_{g1}$		max. 0.5	max. 1.0	μA
As triode					
Anode voltage	V_a	250			V
Cathode resistor	R_k	270			Ω
Anode current	I_a	34			mA
Mutual conductance	S	10.2			mA/V
Amplification factor	μ	18.5			
Internal resistance	R_i	1.8			kΩ
Leakage current between cathode and heater Voltage between cathode and heater V_{kf} = 100 V	I_{kf}		max. 12.5		μA
Insulation resistance between electrodes Voltage between electrodes = 300 V	R		min. 100		MΩ

CAPACITANCES

		I	II	
Anode to grid No.2, grid No.3 cathode and heater	C_{a/g_2g_3kf}	6.0	5.2 - 6.8	pF
Grid No.1 to grid No.2, grid No.3 cathode and heater	C_{g_1/g_2g_3kf}	10	9 - 11	pF
Anode to grid No.1	C_{ag_1}		max. 0.5	pF
Grid No.1 to heater	C_{g_1f}		max. 0.25	pF



SHOCK AND VIBRATION RESISTANCE

The following test conditions are applied to assess the mechanical quality of the tube. These conditions are not intended to be used as normal operating conditions.

Shock

The tube is subjected 5 times in each of 4 positions to an acceleration of 500 g supplied by an NRL shock machine with the hammer lifted over an angle of 30°.

Vibration

The tube is subjected during 32 hours in each of 3 positions to a vibration frequency of 50 Hz with an acceleration of 2.5 g.

LIFE

Production samples are tested to be within the end of life values (column III) during 10 000 hours

LIMITING VALUES (Absolute max. rating system)

Anode voltage	V_{a_o}	max.	600	V
	V_a	max.	450	V
Anode dissipation	W_a	max.	13.5	W
Grid No.2 voltage	$V_{g_{2o}}$	max.	600	V
	V_{g_2}	max.	450	V
Grid No.2 dissipation				
Continuously	W_{g_2}	max.	2.2	W
Peak value in case of exitation by speech and music	$W_{g_{2p}}$	max.	4.4	W

LIMITING VALUES (continued)

Grid No.1 dissipation	W_{g_1}	max.	0.5	W
Grid No.1 voltage	$-V_{g_1}$	max.	100	V
Cathode current	I_k	max.	75	mA
Grid resistor				
Fixed bias	R_{g_1}	max.	0.5	MΩ
Automatic bias	R_{g_1}	max.	1.0	MΩ
Voltage between cathode and heater	V_{kf}	max.	100	V
Bulb temperature	t_{bulb}	max.	225	°C

Heater voltage: The average heater voltage should be 6.3 V.
Variations of the heater voltage exceeding the range of 6.0 V to 6.6 V will shorten the tube life.
The tolerance of heater current (column II) should be taken into account.

OPERATING CHARACTERISTICS

Output tube class A (one tube) [2][3]

Anode voltage	V_a			250			V
Grid No.2 voltage	V_{g_2}			250			V
Cathode resistor	R_k			135			Ω
Load resistance	$R_{a\sim}$			4.5			kΩ
Input voltage	V_i	0	0.3	3.5	4.4	4.8[1]	V_{RMS}
Anode current	I_a	48			50.5	50.5	mA
Grid No.2 current	I_{g_2}	5.5			10.0	11.0	mA
Output power	W_o	0	0.05	4.5	5.7	6.0	W
Total distortion	d_{tot}			7.5	10		%
Second harmonic	d_2			5.7	5.0		%
Third harmonic	d_3			4.5	8.0		%



OPERATING CHARACTERISTICS (continued)

Output tube class A (one tube) [2][3]

Anode voltage	V_a			250			V
Grid No. 2 voltage	V_{g2}			250			V
Cathode resistance	R_k			135			Ω
Load resistance	$R_{a\sim}$			5.2			kΩ
Input voltage	V_i	0	0.3	3.4	4.3	4.7[1])	V_{RMS}
Anode current	I_a	48			49.5	49.2	mA
Grid No. 2 current	I_{g2}	5.5			10.8	11.6	mA
Output power	W_o	0	0.05	4.5	5.7	6.0	W
Total distortion	d_{tot}			6.8	10		%
Second harmonic	d_2			3.0	2.0		%
Third harmonic	d_3			5.8	9.5		%

Anode voltage	V_a			250			V
Grid No. 2 voltage	V_{g2}			250			V
Cathode resistance	R_k			210			Ω
Load resistance	$R_{a\sim}$			7.0			kΩ
Input voltage	V_i	0	0.3		3.5	5.5[1])	V_{RMS}
Anode current	I_a	36			36.8	36	mA
Grid No. 2 current	I_{g2}	4.1			8.5	14.6	mA
Output power	W_o	0	0.05		4.2	5.6	W
Total distortion	d_{tot}				10		%
Second harmonic	d_2				1.7		%
Third harmonic	d_3				8.7		%

OPERATING CHARACTERISTICS (continued)

Output tube class A (one tube) [2]

Anode voltage	V_a		250			V
Grid No.2 voltage	V_{g_2}		210			V
Cathode resistor	R_k		160			Ω
Load resistance	$R_{a\sim}$		7.0			kΩ
Input voltage	V_i	0	0.3	3.4	3.8 [1]	V_{RMS}
Anode current	I_a	36		36.6	36.5	mA
Grid No.2 current	I_{g_2}	3.9		7.3	8.0	mA
Output power	W_o	0	0.05	4.3	4.7	W
Total distortion	d_{tot}			10		%
Second harmonic	d_2			1.8		%
Third harmonic	d_3			9.3		%

Output tube class AB (two tubes) [2]

Anode voltage	V_a	250		300		V
Grid No.2 voltage	V_{g_2}	250		300		V
Cathode resistor	R_k	130		130		Ω
Load resistance	$R_{aa\sim}$	8		8		kΩ
Input voltage	V_i	0	8	0	10 [3]	V_{RMS}
Anode current	I_a	2x31	2x37.5	2x36	2x46	mA
Grid No.2 current	I_{g_2}	2x3.5	2x7.5	2x4	2x11	mA
Output power	W_o	0	11	0	17	W
Total distortion	d_{tot}		3		4	%



OPERATING CHARACTERISTICS (continued)

Output tube class B (two tubes)

Anode voltage	V_a	250		300		V
Grid No.2 voltage	V_{g2}	250		300		V
Grid No.1 voltage	$-V_{g1}$	11.6		14.7		V
Load resistance	$R_{aa\sim}$	8		8		kΩ
Input voltage	V_i	0	8	0	10[3]	V_{RMS}
Anode current	I_a	2x10	2x37.5	2x7.5	2x46	mA
Grid No.2 current	I_{g2}	2x1.1	2x7.5	2x0.8	2x11	mA
Output power	W_o	0	11	0	17	W
Total distortion	d_{tot}		3		4	%

As triode

Output tube class A (one tube)

Anode voltage	V_a		250		V
Cathode resistor	R_k		270		Ω
Load resistance	$R_{a\sim}$		3.5		kΩ
Input voltage	V_i	0	1.0	6.7	V_{RMS}
Anode current	I_a	34		36	mA
Output power	W_o	0	0.05	1.95	W
Total distortion	d_{tot}			9.0	%

Output tube class AB (2 tubes)

Anode voltage	V_a		250			300		V
Cathode resistor	R_k		270			270		Ω
Load resistance	$R_{aa\sim}$		10			10		kΩ
Input voltage	V_i	0	0.95	8.3	0	0.9	10	V_{RMS}
Anode current	I_a	2x20		2x21.7	2x24		2x26	mA
Output power	W_o	0	0.05	3.4	0	0.05	5.2	W
Total distortion	d_{tot}			2.5			2.5	%

1) Grid No.1 current I_{g1} = 0.3 μA
2) Measured with fixed bias

3) With speech and music signal

7Z01426-5.hd.12
I_a (mA)
200
150
100
50
0
V_{g2} = 210V
W_a = 13.5W
V_{g1} = 0V
−2V
−4V
−6V
−8V
−10V
0
50
100
150
200
250
V_a (V)
300

7Z01424-5.hd.12
I_a (mA)
200
150
100
50
0
V_{g2}=250V
W_a = 13.5W
V_{g1}=0V
−2V
−4V
−6V
−8V
−10V
0
50
100
150
200
250
V_a (V)
300



7Z01425-5.hd.12

I_a (mA)

$W_a = 13.5W$ $V_{g1} = 0V$ $V_{g2} = 300V$

−1V −2V −3V −4V −5V −6V −7V −8V −9V −10V −11V −12V −13V −14V

0 50 100 150 200

0 100 200 300 400 500 600 V_a (V)

7Z01423-5.hd.12

I_a (mA)

I_a V_a V_{g1}

$V_{g1} = 0V$ −2.5V −5V −7.5V −10V −12.5V −15V

0 50 100 150 200

0 50 100 150 200 250 300 V_a (V)

7Z01427-5.hd.12

$V_a = 250V$

I (mA)

I_a

210V

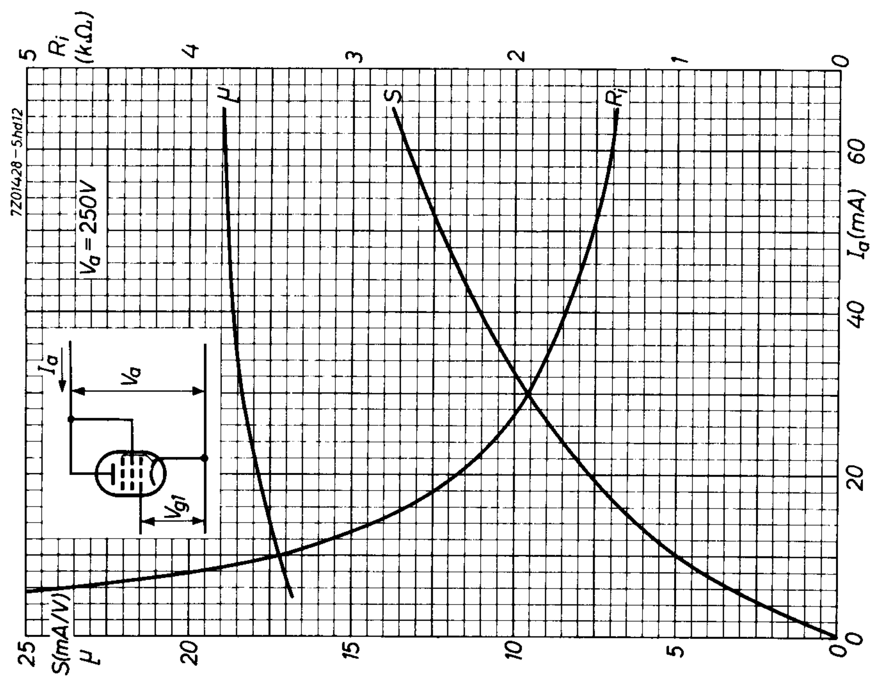
$V_{g2} = 250V$

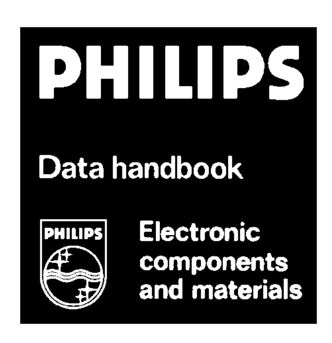
I_{g2}

$V_{g2} = 250V$

210V

V_{g1}(V)





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page	sheet	date
1	1	1968.12
2	2	1968.12
3	3	1968.12
4	4	1968.12
5	5	1968.12
6	6	1968.12
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